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Full Length Research Paper

Socio - economic and environmental risk factors of protein energy malnutrition among children under five years of age in Omdurman pediatric hospital

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The aim of the study is to identify the Socio Economic and Environmental risk factors of protein energy malnutrition among children less than five years of age. Study group consists of all mother's children (120) attending Omdurman Pediatrics Hospital (Sudan) and their children, 0-60 months of age, clinically diagnosed with protein energy malnutrition (Marasmus, Kwashiorkor and Mrasmic Kwashiorkor) during July to November 2011. A survey was conducted through questionnaires and personal interviews. From this study several risk factors were found to be associated with Protein Energy Malnutrition (PEM) including, low education level of the mother, number of children in the family, and age of the child. About 39.1% of the respondent had 5 – 6 children, 74.2% of the respondent had 1 -2 children in family less than 5 years. The higher the families size with the younger ages are more vulnerable to have PEM than those of older age. Also results revealed that PEM was more found in families of history of malnutrition in other sibling and younger age than others with statistically significant differences, 90% of the families earn up to 600 Sudanese Pounds per month. Statistically significant differences between practices of mothers were found regarding breast feeding, artificial feeding and additional and adult food. No statistically significant differences were found regarding incomplete vaccination, management of diarrhea, awareness of oral rehydration salt (ORS) packets and preparation of ORS and significant (P< 0. 05) differences were found in preparation of oral rehydration home-made solution. Health education to the mothers about proper feeding practices, breast feeding, artificial feeding and additional and adult food is recommended to prevent PEM. Increasing mother's awareness related to risk factors of PEM and how to manage the different infections among their children and encourage vaccination at the appropriate time is also recommended.

Keywords: Risk Factor; Malnutrition, Kwashiorkor and Marasmus, Children, Sudan.

INTRODUCTION

Malnutrition is a major health and social problem from which many people are suffering, particularly children. It affects almost 800 million people, 20%of all in the developing countries. It is associated with about half of all

children death worldwide (Kumar et al., 2002). In the Sudan the under-five mortality rate is112 per 1,000 live births Sudan Household Health Survey (Sudan Household Health Survey (SHHS) and Millennium Development Goals (MDG) indicators, 2006). Inadequate food intake is the most common cause of malnutrition worldwide. In developing countries, it is secondary to insufficient or inappropriate food supplies or early cessation of Breastfeeding. In some areas, cultural and religious food customs may play a role. Inadequate sanitation further endangers children by increasing the risk of infectious diseases that increase nutritional losses and alters metabolic demands (Grigsby, 2005). Social, economic, biological, and environmental factors may be the underlying causes for the insufficient food intake or ingestion of foods with proteins of nutritional quality that lead to Protein Energy Malnutrition (PEM). Additional factors are bottle–feeding, inadequate knowledge of proper child rearing practices and parental illiteracy. The most extreme forms of protein-energy malnutrition are Kwashiorkor and Marasmus (Wong et al., 2007). Household socio-economic characteristics also determine to a large extent the nutritional status of children (Kikafunda et al., 1988) and a positive relationship between socio-economic status and the ability of mothers to provide adequate food and primary care has been observed (Wong et al., 2007). Prevention of malnutrition in children starts with an emphasis on prenatal nutrition and good prenatal cares, health care providers should emphasis on the importance of breast feeding in the first years of life, in addition to the promotion of breast feeding, they should counsel parents on the appropriate introduction of nutritious supplemental foods. All pediatric nurses must understand the importance of optimal nutrition for the normal healthy child; the nurse knows that in order for children of all ages to reach the goal of adequate nutrition, up- to- date advice and dietary support must be provided (Wong et al., 2007).

The aim of the study was to identify the Socio Economic, Environmental risk factors of protein energy malnutrition (Kwashiorkor and Marasmus & Mrasmic Kwashiorkor) among children under five years of age in Omdurman Pediatric Hospital (Sudan).

MATERIALS AND METHODS

Study group consists of all mother's children (120) attending Omdurman Pediatrics Hospital (Sudan) and their children, 0-60 months of age, clinically diagnosed with protein energy malnutrition (Marasmus, Kwashiorkor and Mrasmic Kwashiorkor) during July to November 2011. A survey was conducted through questionnaires and personal interviews. The structured interview questionnaire was developed, specifically to collect data related to this study from family socioeconomic scale included, the educational level of the father and, income of the family in month, occupation of the father, housing condition and residence .Socio-demographic data related to mothers such as mother's age, educational level, working condition, residence, family size, if a mother had more than one child less than five years. Identification data related to the child as age of the child, sex, birth order, diagnosis, type of feeding, type of milk and vaccination. Mother's practices as they responded related to breast feeding, artificial feeding and additional and adult foods .The nutrition knowledge of mothers was evaluated. Each mother was asked a set of seven questions about nutrition. The aspects of nutrition knowledge studied were (a) age for introducing solid foods into a child's diet and the type of solid foods to introduce (b) frequency of child feeding, (c) diet during diarrhea, (d) management of diarrhea, (e) awareness of oral rehydration therapy (ORT), (f) preparation of oral rehydration salt (ORS) packet, (g) preparation of oral rehydration home-made solution.

A mother's responses were considered valid if she provided the following information: Soft and semisolid foods should be introduced to children at the age of six months or less. Children should be fed more than three times a day. A child should be given as much or more food during diarrheal episodes as when the child is not ill. Diarrhea should be managed by giving ORS or fluids to the affected child. ORS should be made with three standard tablespoons of sugar and one-half standard teaspoon of salt per liter of water.

The data collected was analyzed using the Statistical Package for Social Sciences (SPSS) Programme. Cross - Tabulation was done comparing various factors and chi-Square used to determine the significance of the differences. The significant P- value was less than 0.05($P < 0.05$).

RESULTS AND DISCUSSION

Table 1 shows the Socio-demographic characteristics of mothers of the malnourished children, Omdurman Pediatrics Hospital. Statistically significant ($P < 0.05$) difference were found regarding to age of the mother , education level of parents, working condition of mothers, residence, marital status , income of the family in month , number of children in family less than five years. About 70.0% of mothers belonging to the age 20 -29 years. The marriage at young ages have health implications for both mothers and children indicated in many studies, higher prevalence (38.3 %) of illiteracy among mothers, while university education constituted among 4.1% of fathers. The lowest educational level of the mothers was considered a risk factor for malnutrition in the present study. Findings of this study are in agreement with Yousef (2000), Ahmed (2003) and Washi et al. (1993) who found that the higher educational level of the mothers , the better preparation and estimation of mal-

Table 1. Socio-demographic characteristics of mothers of the malnourished children at Omdurman Pediatrics Hospital.

Item	No	%	Chi-Square	P. value
Age of the mother:				
20 years <	84	70,0	78.6	0.000
30 years <	29	24.2		
40 years and more	07	5.8		
Educational level of mother:				
Illiterate	46	38.3	40.8	0.000
Basic education	46	38.3		
Secondary	24	20.0		
University	4	3.4		
Educational level of father:				
Illiterate	18	15.0		
Basic education	59	49.2	85.50	0.000
Secondary	38	31.7		
University	5	04.1		
Working condition of Mother:				
Working	27	22.5	40.8	0.000
House wives	93	77.5		
Income of the family in month:				
< 300 Sudanese Pounds	47	39.2	31.85	0.000
300 – 600 Sudanese Pounds	61	50.8		
> 601 Sudanese Pounds	12	10.0		
Working condition of Father:		41.7		
Professional Working	50	58.3	3.33	0.068
Not Professional Working	70			
Residence:				
Urban	40	33.3	13.3	0.000
Rural	80	66.7		
Number of children in family less than 5: years				0.000
1 – 2	89	74.2	60.6	
3 – 4	12	10.0		
None	19	15.8		
Family size:				
< 4 persons	40	33.3	2.45	0.294
5 – 6 persons	47	39.1		
7 and more	33	27.5		
Marital status of mother:				
Divorced and widow	4	3.4	114.9	0.000
Married	126	96.6		

nutrition in their children . Low level of mothers education was associated with high relative risk and high etiologic for malnutrition (Khin-Maung et al., 1999). Another aspect of socioeconomic development is income. 90% of the families earn up to 600 Sudanese Pounds per month. WHO/EMRO (1995) stated a rise in income almost results in rise in food expenditure .The family size is an important determinant of child health. Data given in Table (1) indicates that 5 – 6 children were most common in selected data. About 39.1% of the respondent had 5 – 6 children. 74.2% of the respondent had 1 -2 children in family less than 5 years i.e. the higher the families size the lower care given to the children.

Statistically significant (P< 0. 05) difference was found between children in their type of house property, number of rooms, sources of water and latrine in the house (Table 2). About 33.3% of children lived in a rent house

Table 2. Family living conditions of the malnourished children at Omdurman Pediatrics Hospital.

Item	NO	%	Chi-Square	P. value
Type of house property:				
Property	55	45.9		
Rent	40	33.3	53.40	0.000
Government	1	00.8		
Others (Scattered house)	24	20.0		
Number of rooms in the house:				
>3	50	41.7		
3-5	48	40.0	12.20	0.002
>5	22	18.3		
Source of water in the house:				
Pipeline in the house	56	46.7		
Public Source	13	10.8	27.65	0.000
Others (Caro)	51	42.5		
Type of latrine:				
Siphon	25	20.8		
Traditional (Pit hole)	72	60.0	38.45	0.000
None	23	19.2		
Availability of kitchen:				
Available	70	59.3	3.33	0.068
Not available	50	41.7		

and 20% lived in scattered house. It was shown that 42.5% get their water from Caro (donkey cart), while 60.0% of children had pit hole (traditional) and 19.2% of children had no latrine. These results agree with Park and Park (2002) who mentioned that where family living conditions are poor children suffer from malnutrition.

Table (3) shows identification data of the malnourished children at Omdurman Pediatrics Hospital. Statistically significant (P< 0. 05) differences were found regarding their age and history of malnutrition in other siblings. The present study revealed that 63.3% of children their ages were ranged from 1< 2 year, this can be explained that food supply did not meet rapid rate of growth; this study agrees with Sabry (2004) who found that the majority of children with malnutrition 94% their age ranged from 6 to less than 15 months and illustrated that 33.3% of children in the age group ranged from 6 to 24 months exposed to under nutrition. While children aged2- 5years were20.0 % and 25.8 % of them were found in history of malnutrition in other sibling. Statistically significant differences were regarded to birth order and incomplete vaccination, 30.0 % of children their birth order was the fifth or more. In addition the table (3) shows that 71.7 % of children had Marasmus. Many studies found that children who were of the fifth or higher birth order had significant higher risk for malnutrition when compared with those who were of the first or second birth order (Thabet, 2002; Sandiy et al., 2004).

Table (4) shows the identification data of the malnourished children at Omdurman Pediatrics Hospital. Statistically significant (P< 0. 05) differences were found regarding two types of feeding offered since birth, types of milk, causes of artificial feeding and method of feeding, 45.8% of children were on breast feeding, while artificial feeding was constituted in 34.2%. Goat milk was prevalent (40.8%) in feeding patterns of children than other types. Regarding causes of artificial feeding responded by mothers of children were, pregnancy of mothers (40.8%) diseases of children (28.3%) and time factors (20.0%). with statistically significant difference. In addition the present study indicated that using of goat milk and bottle feeding was most popular among children with statistically significant (P< 0. 05) differences. So exposure of children to artificial feeding, using milk and bottles are considered risk factors of malnutrition among children, because the type of sterilization was only water (53.4 %), mothers may be dilute the formula which affect the constitution of milk and lead to inadequate intake of suitable food elements as well as improper preparation of artificial feeding.

Table (5) shows mothers' practices related to additional and weaning food of the malnourished children at Omdurman Pediatrics Hospital. Statistically significant differences were found related to time of starting the additional food and item of elements of food. More than half of mothers start additional food before 6 months (58.4%), while 25.0% of them start additional food from 8

Table 3. Identification Data of the Malnourished Children at Omdurman Pediatrics Hospital.

Item	No.	%	P. value	Sig.
Age of the child :				
2m < 1 years	20	16.7	8.35	0.003
1 < 2 years	76	63.3		
2 – 5 years	24	20.0		
Sex:			0.000	1.000
Male	60	50.0		
Female	60	50.0		
Birth order:				
First	16	13.3		
Second	27	22.5	10.25	0.036
Third	22	18.4		
Fourth	19	15.8		
Fifth and more	36	30.0		
Diagnosis:				
Marasmus	86	71.7	30.00	0.000
Kwashiorkor	30	25.5		
Miasmic Kwashiorkor	4	3.4		
Incomplete Vaccination:	50	41.7	3.33	0.068
History of malnutrition in other siblings:	31	25.8	28.0	0.000

Table 4. Feeding pattern of the malnourished children, Omdurman Pediatrics at Hospital.

Item	NO	%	P. value	Sig.
Type of feeding offering since birth:				
Breast feeding	55	45.8	12.05	0.002
Artificial feeding	41	34.2		
Additional and adult food	24	20.0		
Type of milk:				
Cow	24	20.0	23.40	0.000
Goat	49	40.8		
Powder	34	28.3		
Mixed	13	10.8		
Causes of artificial feeding:				
Time factors	24	20.0		
Diseases of mothers	13	10.8	23.40	0.000
Diseases of children	34	28.3		
Pregnant of mothers	49	40.8		
Method of feeding:				
By hand	40	33.3	22.73	0.000
By bottle	44	36.7		
By cup	25	20.8		
By spoon	11	9.2		
Types of sterilization:				
Boiling water	16	13.3	28.80	0.000
Boiling water with soap	40	33.3		
Water	64	53.4		

Table 5. Mothers' practices related to additional and weaning food of the malnourished children at Omdurman Pediatrics at Hospital.

Item	NO	%	P. value	Sig.
Time of starting additional food:				
Before 6 months	70	58.4		
6 - < 8 months	16	13.3	82.40	0.000
8 - < 12 months	30	25.0		
12 months and more	4	03.3		
Element of food:				
Carbohydrate+ Protein	51	42.5	2.70	0.100
Carbohydrate+ Protein +Butter, oil	69	57. 5		
Number of meals / day:				
1	03	2.5		0.000
2	44	36.7	77.0	
3	62	51.6		
4 or more	11	9.2		
Manner of feeding				
By self	004	3.3	97.2	0.000
By mother	116	96.7		
Keeping of food:				
In the refrigerator	6	5.0	97.2	0.000
Out of the refrigerator	114	95.0		

< 12 months .Not all elements of food were provided among child meals .About 42.5% of children their meals were carbohydrate (CHO) and protein i.e. bread with broad bean or lentils, while 57.5% of children their meals were CHO, protein, and lipids i.e. Asida or kisra with mullah (traditional Sudanese foods) ,bread with egg or soups . Statistically significant (P< 0. 05) differences were found related to number of meals per day, manner of feeding and preservation. Result of the present study indicated that statistically significant (P< 0. 05) differences were found with regarded to mother's practices related to time of starting additional food and elements of food. 28.3% of mothers delayed starting additional food to their children after 8 months. These results agreed with those obtained by Yousef (2000). WHO (1996) reported that it is essential to start weaning foods at 6 months of age in addition to being high quality food, the order of food introduction, as well as specific amount to be given, are based on traditions rather than on scientific studies (Behrman et al., 2006), Although 60.8% of the mothers were of the opinion that children should eat three times a day or more, this knowledge factor had no significant bearing on their children's nutritional status. This finding can be explained in that income was an intervening factor affecting the children's nutritional status. It is likely that, although the mother had the knowledge she needed, she was unable to put it into practice because of economic or time constraints. Knowledge of weaning, duration of breastfeeding and frequency of feeding were similar in studies in Sudan (Coulter et al., 1988; Suliman et al., 2011), and in Nairobi, Kenya (Waihenya et al., 1996). Waihenya et al. (1996) found that children were still at high risk of malnutrition despite adequate nutrition knowledge by the mothers. Willingness and ability to translate this nutrition knowledge into action is crucial in reducing levels of malnutrition (Jalil, 1991).

Table (6) shows distribution of the malnourished children at Omdurman Pediatrics Hospital according to the type of disease. The most common diseases were found to be digestive tract (43.3%), respiratory infection (27.5%) malaria (20%) and others (9.2%). All these diseases may be due to poor sanitation and overcrowding (WHO, 2000).

Table (7) shows mothers' practices related to awareness and preparation of oral rehydration salt of the mothers of the malnourished children at Omdurman Pediatrics Hospital. Close to one-third (37.5%) of mothers stop breastfeeding during diarrhea, about (45.0%) of respondent went to health unit to got care, while 55% of respondents used traditional health care at home. No statistically significant (P< 0. 05) differences were found regarding the management of diarrhea, awareness of oral rehydration salt (ORS) packets, preparation of oral rehydration salt packet significant (P< 0. 05) differences were found in preparation of oral rehydration home-made solution .About more than one-fourth (43.3%) of Woman has ever used ORS packets, while 56.7% of the women know about ORS. the knowledge of the correct preparation of ORS of the women was 56.7%. There was

Table 6. Distribution of the malnourished children at Omdurman Pediatrics Hospital according to the type of diseases.

Item	NO.	%	P. value	Sig.
Digestive tract :				
Yes	52	43.3	21.33	0.164
No	68	56.6		
Respiratory infection :				
Yes	33	27.5	24.30	0.000
No	87	72.5		
Malaria:				
Yes	24	20.0	43.20	0.000
No	96	80.0		
Others(Anemia, Typhoid, measles):				
Yes	11	9.2	80.03	0.000
No	109	91.8		

Table 7. Mothers' practices related to awareness and preparation of oral rehydration salt of the mothers of the malnourished children at Omdurman Pediatrics Hospital.

Item	NO	%	P. value	Sig.
Breastfeeding during diarrhea				
Yes	45	37.5	7.50	0.006
No	75	62.5		
Type of diet during diarrhea				
Breast feeding	12	10.0		
Carbohydrates only	16	13.3	72.91	0.000
Carbohydrates & protein	58	48.3		
Carbohydrates & lipids	5	04.2		
Carbohydrates &protein & lipids	29	24.2		
Management of diarrhea				
Go to health unit	54	45.0	1.20	0.237
Traditional health care at home	66	55.0		
Awareness of oral rehydration Therapy(ORT)				
Woman knows about ORT	68	56.7		0.144
Woman has ever used ORT	52	43.3	2.13	
Preparation of oral rehydration salt(ORS) packet:				
Correct preparation	68	56.7	2.13	0.144
Incorrect preparation	52	43.3		
Preparation of oral rehydration home-made solution :				
Correct preparation	25	20.8	40.83	0.000
Incorrect preparation	95	79.2		

a significant (P< 0. 05) difference between knowledge of the correct preparation of homemade preparation or ORS.

From this study it can be concluded that several risk factors were found to be associated with PEM including: Lower education level of the mother; number of children in the family, age of the child. Children with the younger age are more vulnerable to have PEM than those of older age and unsatisfactory practices of mothers regarding feeding of their children increase the prevalence of PEM among their children. The study recommends health education to the mothers about proper feeding practices, breast feeding, artificial feeding, additional and adult food to prevent PEM. Also increasing mother's awareness related to risk factors of PEM and how to manage the different infections among their children and encourage vaccination at the appropriate time.

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